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heights of Olympus; but the fight, let us say, is good,—and as we are assured by Zarathustra "der gute Krieg ist es, der jede Sache heiligt."

In its historical development philosophy resembles art more than science. The sophomore who takes "Philosophy 4" soon learns just what Descartes said and Hume opined; while the student of physics may have heard of Newton, or perhaps not,—Newton himself being a perfectly negligible quantity. A system of philosophy is a personal product, and when the man who made it is through, the system is finished and closed forever, like a poem. Each philosopher starts anew and cuts his system out of the whole cloth of his own life-experience. In this region there is nothing to correspond with the continuous accretive accumulation of science. The scientist takes the work of his predecessors, and after assigning to oblivion whatever is unverifiable, he adds his own contribution to the residue. In the process the personality of the workers is eliminated and dropped by the wayside.

Philosophy has a great show of logic, yet fancy Hegel and Herbert Spencer trying to convince each other: Hegel the devotee to Heraclitus the Obscure, and Spencer the civil engineer. The difference between their philosophies was rooted in the deeper difference of the two lives. The man who habitually centers on facts, things and dimensions will make a realist in metaphysics. On the other hand, the man who views the world as persons and meanings will find his way into the idealistic camp. These two chronic methods of envisaging the world underlie the respective philosophical positions at a point farther down than their logic begins.

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CAUSALITY

FACTS seem to have distanced the growth of our categories. Nowhere is this more evident than in the case of causation. It is not too much to maintain that naturalism demands a reinterpretation and deepening of this category that will enable it to account adequately for the development and presence of organic forms and social institutions in the same universe with nebulæ and dark stars. Can a formula for causation be found comprehensive enough to cover these varied conditions? This is undoubtedly one of the crucial questions of contemporary metaphysics. Its solution should give tremendous impetus to the advance of a more plastic naturalism.

Some time ago I sought to indicate a solution of the time problem with much the same judgment of the situation in mind.[1] I wish now to set forth in outline a view of causality which is in harmony with the position there presented. Since the conception to be developed in the present article has been reached inductively in large measure, and hence as independently as possible of the other field, the fact that the two categories, time and causality, interpenetrate and harmonize in so luminous a way serves as a mutual confirmation. One conspicuous divergence from the usual treatment will be found in the connection of causality with the spatial character of reality. Time and space will be lifted from their separateness and be shown to involve one another. *Causality will, in brief, be proven to mediate space and time in a process view of reality.* The endeavor to establish the intimate union of these three categories will, at any rate, be suggestive.

Causation may be regarded as empirical or as ontological. This distinction corresponds to that between time as a construction within the individual's experience and time as change in the reality-process, and it has its roots in the relation of the individual's experiencing to the world-process of which he is a part.

As is well known, the cause was for a long time identified with the "ground" or sufficient reason. Hume it was who brought into general recognition its temporal and empirical, as against its rationalistic character. Of late years there has been on the part of the absolute idealists a strong tendency to swing back to the earlier position. This is an outgrowth of their aversion to time. As I have defended the reality of time as change, it is evident that I must regard as erroneous the identification of the cause with the reason or the explanation. Exact definition and discrimination must be called in to aid in the avoidance of ambiguity, since the word cause is sometimes used with the signification of reason, *i. e.*, the "why" in the Aristotelian sense.

Strictly speaking, a cause is never repeated. Cosmic history, like human history, is unique. Venn, among others, has well shown this unrepeatable character of a cause when taken in the strict scientific sense, that is, in its complete particularity, and has deduced therefrom its hypothetical character with reference to succeeding events. This is evidently in line with the identification of time with change.

The similarity of causal processes, which forms the basis for generalization and for the practical application of past experience to the present, is dependent on existential repetition, *i. e.*, on the simultaneity or spatial side of reality. Like substances under like conditions give like results. The chemist who has a small quantity of a hardwon substance realizes this acutely. If he uses all in one experiment he can not repeat until he secures his factors again. There are two kinds of uniformities, the temporal and the spatial; and only the first has received adequate emphasis in theory.

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[1] This JOURNAL, Vol. V., Nos. 20 and 22.

Another distinction must be made to prevent confusion. The term cause must be differentiated not only from that of ground, but also from what may be designated the "occasion" or force of detent. A lighted match is the occasion for the explosion of a flask of powder, but is not the cause in the strict scientific sense. As a result of this distinction, the quantitative equivalence of cause and effect as interpreted in terms of energy need not be denied. "Nothing occurs without equivalent transformation of one or more forms of energy into other forms." This is really only the assertion of the principle of the conservation of energy and concerns the temporal aspect of causality. Energy is predominantly a temporal category.

Finally, we must not fail to recollect the arbitrary character of what is selected as *the* cause by popular thought in any causal process. Such selection is the function of some interest. For metaphysics we must hold clearly in mind the fact of a continuous process of change in some system and must not be led into mental quagmires by the inadequacies and confusions of popular terminology.

When time is identified with change the problem of the continuity of cause and effect no longer exists. Causality is immanent. If we so desire, we may call the state of equilibrium the effect. A change in any causal system thrown into the form of time as a construction within the individual's experience with its distinctions of past, present, and future, gives the temporal expression of causality found in both Hume and Kant. With the preceding cautions duly noted, no difficulty need be found in empirical causation which good logic will not solve. Let us, then, regard the uses of the terms cause and effect as a methodological question and concern ourselves with causality.

Upon studying causality more closely by means of the analysis of concrete cases of change, we become aware that past theory was not empirical enough. The examination of the "when," "in what manner," and "for how long," characteristics which differentiate unique causal processes, did not receive adequate recognition. As Ostwald sees, the structure of the interacting factors determines the time variable, *i. e.*, the rate of change, and the end result. Manifold illustration of this fact could be given. The interdependence of structure and function in the organic realm would furnish numerous instances alone. Organization must then be acknowledged as essential to the nature of any causal process.

Now, if organization is a factor in the causal process at present, it must always have been a factor, or the nature of causality must have abruptly changed at some remote time in the past. There is no reason to assume the discontinuity of a passage from the homogeneous to the heterogenous. Such terms are essentially relative. But the complexity of organization may well have increased in parts of reality. Not only is there no *a priori* reason against such a proposition, but science in its evolutionary outlook is everywhere in its favor. It must be understood, however, that I am not advocating a linear evolution for the universe as a whole. When the universe is regarded as stereometrical and time is identified with change within such a process, what holds for one or more subsystems need not apply to all subsystems at once. Organization is, then, a variant in the universe, but an effective variant which determines immanently its own change.

For some centuries we have been asked to choose between two juxtaposed forms of causality, mechanism and teleology. This has seemed to me a harsh and unreal disjunction resulting from clumsy thinking which did not approach, or even seek to approach, the subtlety of nature. Organization enables us to surmount this antithesis just as in the consideration of time it was shown to mediate between flux and permanence. *The result is the doctrine of grades of causal relation and activity dependent on the organization of the interacting parts of a causal system.* With this view granted, the qualitative at last receives recognition, and the real presence of variety, which evolution demands, is faced. What other agent to account for *directed change* seems thinkable except organization? It has at least three obvious merits: First, that of accounting for the conservation of past activity; secondly, that of furnishing a pivot for development; thirdly, the merit of control. Only when these three aspects are understood in their interrelation can evolution be grasped. A very good example of this method of advance mediated by organization can be taken from psychology. Habits are the precipitate of activity, they furnish the means for the development of new habits and they also control the kind of habits to be formed, at least in part—why only in part is another story which involves the spatial side.

The best approach to the spatial side of causality can be made by a study of what I should call causal systems. An example may be given in lieu of a detailed description. An organism and its environment would together compose a causal system. These systems may be of all grades of complexity and may involve one another in the most intricate fashion. Such a system may be dichotomized and the interaction between the parts so obtained will be seen to be selective or controlled by the "form" of the parts. In lower grades of causality a dichotomy can not be made with the same ease, or need not even be sought if individualization of some part of the system has not proceeded far enough. Let us take for analysis the reaction of an amœba to a stimulus. Suppose the reaction to be positive. We have immediately a system in process of transformation. No matter what the result, experiment can prove neither loss nor gain of energy. But when we look at this system spatially, we find that the two main objects in interaction, the stimulus and the amœba, play different rôles. The selection appears on the side of the amœba and not on that of the object stimulating the amœba. Selection involves this spatial or simultaneity aspect, not the temporal aspect of the transformation within the system as a whole. Moreover, it must be noted that by spatial I do not mean merely a cross-section view, but a stereometrical view, *i. e.*, the massing of co-existent factors as organized and in relation to one another.

I stated in a previous article that time would be understood completely only after causality had been conquered. The reason for this statement is now apparent. Change has its *Innigkeit* in causality and *directed change* is comprehended only when it is seen that causality controls itself by organization. Quite obviously, it seems to me, our analysis has proven that causality mediates space and time. This is the first time to my knowledge that the intimacy of these categories has been grasped.

The relation between the "occasion" or force of detent and the doctrine of grades of causal activity deserves mention. Selectiveness in man's conquest of nature and in his employment of machines consists largely in his ability to control the occasion. He becomes a factor in a larger system, but his function is to disturb the compensation in definite subsystems. Man thus chooses the "when," the "where," and the "manner." In all this selective activity there is no violation of energetics or of conservation; yet, because of his selectiveness and his employment of machines, man changes the face of nature. The concerted action of numbers of men socially organized carries us to a height of selectiveness which physics is unable to conceive, but which is nevertheless real, for in such activity we are every-day participators. Since we have decided to hold unswervingly to continuity and to naturalism these facts must also be reckoned with.

I will close with a statement of what still remains to be explicated. First, causal systems are only relatively self-determining. The degree of their self-determination depends usually on the grade of their organization. This problem can be worked out only by the sciences. It can be seen that *the principle of continuity needs reinterpretation in the light of this new view of causality.* It will lead, I think, to a mediation of monism and pluralism. Secondly, man dominates the causal systems into which he enters. This is the meaning of his relative freedom or autonomy. This fact also has bearing on the principle of continuity. Thirdly, grades of causal activity may be simultaneous in a system. A man falls like a stone, but if he sees a rope near he will grasp it, which it is needless to say the stone will not do. Fourthly, the idea of the quantitative and the qualitative requires entire overhauling.

It is evident that I am seeking to attain a stereoscopic view of reality. Of the ideal I have little doubt; my success must be left to the readers for judgment.

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REVIEWS AND ABSTRACTS OF LITERATURE

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It is difficult, if not impossible, for a philosopher to admire a paper whose results are repugnant to him, or to appreciate the weaknesses of one that accords with his sympathies; nevertheless, I shall try in this notice to distinguish good and bad reasoning from welcome and unwelcome theory. Thus Mr. Haldane's paper, "The Methods of Modern Logic and the Conception of Infinity," welcome as must be his repetition of the argument against the "bad" infinite, yet considered as a criticism of the modern logic of infinity seems to me to be an *ignoratio elenchi.* The important question is, how far is the genuine infinite consistent with the definitions of infinity given by pure or exact logic? Professor Taylor, at least, in his criticism of Royce's discussion of infinity, has set a better example than this one, for, though his results are not to me as agreeable as Mr. Haldane's, yet he does take up the infinite of logic and mathematics.

Mr. Latta's paper on "Purpose" seems to me to suffer from lack of a well-defined method. There are at least three possible ways of investigating the meaning of a concept. One may start with a definition (taken from the dictionary, perhaps) and develop, by *a priori* implication, all that can be deduced from that definition. This would be the natural method in mathematics; it may be called the deductive method. Or one may seek a definition inductively, by marking out a certain circle of facts as the denotation of the concept he investigates, and by trying to discover the essential attributes of those facts as the material of the definition. This is the method of the inductive sciences. Or, finally, one may seek the ways in which the term is used by men, and try to patch up one consistent definition out of them all. This means the consulting of dictionaries, text-books, and men. It may be called the linguistic method; it does not directly enlarge our knowledge, but settles questions of termin-